Luis Rademacher

Department of Mathematics
University of California, Davis
One Shields Avenue.
Davis, CA 95616

Last updated: May 22, 2021
lrademac@math.ucdavis.edu
http://www.math.ucdavis.edu/~lrademac/

EDUCATION

- **PH.D. IN MATHEMATICS** June 2007
  Department of Mathematics.
  Massachusetts Institute of Technology. Cambridge, MA. USA.
  Thesis: *Dispersion of Mass and the Complexity of Geometric Problems.*
  Advisor: Santosh Vempala.

- **MATHEMATICAL ENGINEERING TITLE (MASTERS EQUIVALENT)** August 2002
  Department of Mathematical Engineering.
  Universidad de Chile. Santiago, Chile.
  Thesis: *Computation and Stability of Nash Equilibria and Applications to the Modeling of the Electrical Energy Generation Market.*
  Advisor: Alejandro Jofré.

- **BACHELOR IN ENGINEERING SCIENCES, MAJOR IN MATHEMATICS** August 2002
  Department of Mathematical Engineering.
  Universidad de Chile. Santiago, Chile.

RESEARCH INTERESTS

Theoretical computer science, foundations of data science, discrete and convex geometry, matrix computations, machine learning, optimization.

EMPLOYMENT AND OTHER RESEARCH EXPERIENCES

- **ASSOCIATE PROFESSOR** July 2018–Present
  Department of Mathematics.
  University of California, Davis, CA. USA.

- **ASSISTANT PROFESSOR** July 2016–June 2018
  Department of Mathematics.
  University of California, Davis, CA. USA.

- **ASSISTANT PROFESSOR** September 2009–May 2016
  Computer Science and Engineering.
  The Ohio State University. Columbus, OH. USA.

- **POSTDOCTORAL FELLOW** August 2007–July 2009.
  College of Computing.
  Georgia Institute of Technology. Atlanta, GA. USA.

- **GRADUATE RESEARCH ASSISTANT** Fall 2006, Fall 2007.
  Department of Mathematics.
  Massachusetts Institute of Technology. Cambridge, MA. USA.

- ■ SUMMER INTERN   Summer 2005.
  Toyota Technological Institute - Chicago, IL. USA.

- ■ DISSERTATION RESEARCH   2001–2002.
  Mathematical Engineering Department.
  University of Chile. Santiago, Chile.

GRANTS, AWARDS AND FELLOWSHIPS

- ■ NSF Award: "AF: Small: High-dimensional geometry and probability for efficient inference" (2020-2023).

- ■ NSF Award: "AF: Small: Geometry and High-dimensional Inference" (with co-PI Mikhail Belkin) (2014-2017).

- ■ NSF Early CAREER Award: "Transforming data analysis via new algorithms for feature extraction" (2014-2021).

- ■ "Johnson Prize" from MIT Department of Mathematics for an outstanding research paper published by a graduate student (2007).

- ■ "Marcos Orrego Puelma Award" from the Institute of Engineers of Chile, for the best engineering student graduated from University of Chile during 2002. (2003)

- ■ Liberty Mutual Insurance Company/Boston Foundation Fellowship. (2002-2003)

TEACHING AND MENTORING EXPERIENCE

- ■ Course on "Randomized algorithms and matrix decompositions" for the Sixth Summer School of Discrete Mathematics at the Institute of Complex Systems (January 2011), Valparaiso, Chile.

- ■ Instructor of "Computability and complexity", "Randomness and geometry in the design of algorithms", "Foundations II: Data structures and algorithms", "Sparse representations and compressed sensing", "Automata and formal languages", Computer Science and Engineering, The Ohio State University.

- ■ Mentor for the Summer Program in Undergraduate Research, MIT. 2007.

PUBLICATIONS

PEER REVIEWED JOURNAL ARTICLES

- ■ *The Minimum Euclidean-Norm Point in a Convex Polytope: Wolfe's Combinatorial Algorithm is Exponential.* J. De Loera, J. Haddock, L. Rademacher. SIAM Journal on Computing, 2020.

- ■ *Eigenvectors of Orthogonally Decomposable Functions* M. Belkin, J. Voss, L. Rademacher. SIAM Journal on Computing, 2018.

- ■ *On packing and covering polyhedra in infinite dimensions.* L. Rademacher, A. Toriello, J. P. Vielma. Operations Research Letters, 2016.

- ■ *A simplicial polytope that maximizes the isotropic constant must be a simplex.* L. Rademacher. Mathematika, 2015.

- *Expanders via random spanning trees.* A. Frieze, N. Goyal, L. Rademacher, S. Vempala. SIAM Journal on Computing 2014.

- *Query complexity of sampling and small geometric partitions.* N. Goyal, L. Rademacher and S. Vempala. Combinatorics, Probability and Computing 2014.

- *Lower bounds for the average and smoothed number of Pareto-optima.* T. Brunsch, N. Goyal, L. Rademacher, H. Röglin. Theory of Computing, 2014.

- *On the monotonicity of the expected volume of a random simplex.* L. Rademacher. Mathematika 2012.

- *Partitioning a planar graph of girth 10 into a forest and a matching.* A. Bassa, J. Burns, J. Campbell, A. Deshpande, J. Farley, M. Halsey, S.-Y. Ho, D. Kleitman, S. Michalakis, P.-O. Persson, P. Pylyavskyy, L. Rademacher, A. Riehl, M. Rios, J. Samuel, B. E. Tenner, A. Vijayasarathy, L. Zhao. Studies in Applied Mathematics 2010.

- *Optimization of a convex program with a polynomial perturbation.* R. Kannan and L. Rademacher. Operations Research Letters 2009.

- *Dispersion of mass and the complexity of randomized geometric algorithms.* L. Rademacher and S. Vempala. Advances in Mathematics 2008.

- *Matrix approximation and projective clustering via volume sampling*. A. Deshpande, L. Rademacher, S. Vempala and G. Wang. Theory of Computing 2006.

PEER REVIEWED CONFERENCE PROCEEDING ARTICLES

- *Efficiency of the floating body as a robust measure of dispersion.* J. Anderson, L. Rademacher. SODA 2020.

- *The Minimum Euclidean-Norm Point in a Convex Polytope: Wolfe's Combinatorial Algorithm is Exponential.* J. De Loera, J. Haddock, L. Rademacher. STOC 2018.

- *Heavy-Tailed Analogues of the Covariance Matrix for ICA.* J. Anderson, N. Goyal, A. Nandi, L. Rademacher. AAAI 2017.

- *Basis learning as an algorithmic primitive.* M. Belkin, L. Rademacher, J. Voss. COLT 2016.

- *The hidden convexity of spectral clustering.* J. Voss, M. Belkin, L. Rademacher. AAAI 2016.

- *A pseudo-Euclidean iteration for optimal recovery in noisy ICA.* J. Voss, M. Belkin, L. Rademacher. NIPS 2015.

- *Heavy-tailed Independent Component Analysis.* J. Anderson, N. Goyal, A. Nandi, L. Rademacher. FOCS 2015.

- *The more, the merrier: the blessing of dimensionality for learning large Gaussian mixtures.* J. Anderson, M. Belkin, N. Goyal, L. Rademacher and J. Voss. COLT 2014.

- *Fast algorithms for Gaussian noise invariant Independent Component Analysis.* J. Voss, L. Rademacher and M. Belkin. NIPS 2013

- *Efficient learning of simplices.* J. Anderson, N. Goyal and L. Rademacher. COLT 2013.

- *Blind signal separation in the presence of Gaussian noise.* M. Belkin, L. Rademacher and J. Voss. COLT 2013.

- *Lower bounds for the average and smoothed number of Pareto optima.* N. Goyal and L. Rademacher. FSTTCS 2012.

- *Efficient volume sampling for row/column subset selection.* A. Deshpande and L. Rademacher. FOCS 2010.
- *Learning convex bodies is hard.* N. Goyal and L. Rademacher. COLT 2009.
- *Expanders via random spanning trees.* N. Goyal, L. Rademacher and S. Vempala. SODA 2009.
- *Approximating the centroid is hard.* L. Rademacher. SOCG 2007.
- *Dispersion of mass and the complexity of randomized geometric algorithms.* L. Rademacher and S. Vempala. FOCS 2006.
- *Computing equilibrium prices in exchange economies with tax distortions.* B. Codenotti, L. Rademacher and K. Varadarajan. ICALP 2006.
- *Matrix approximation and projective clustering via volume sampling.* A. Deshpande, L. Rademacher, S. Vempala and G. Wang. SODA 2006.
- *Testing geometric convexity.* L. Rademacher and S. Vempala. FSTTCS 2004.

INVITED TALKS AND POSTERS

- *On the smoothed complexity of Frank-Wolfe methods*
  - Information Theory and Applications Workshop, San Diego, CA. 2020

- *Efficiency of the floating body as a robust measure of dispersion*
  - Information Theory and Applications Workshop, San Diego, CA. 2019
  - Invited talk, Mathematical Physics and Probability, University of California, Davis, 2019.

- *The minimum Euclidean norm point in a polytope: Wolfe's method is exponential*
  - Invited talk, Geometric Functional Analysis and Applications, Mathematical Sciences Research Institute, Berkeley, CA. 2017
  - Information Theory and Applications Workshop, San Diego, CA. 2018
  - Reunion Workshop, Foundations of Machine Learning, Simons Institute for the Theory of Computing, Berkeley, CA. 2018

- *Provably efficient high-dimensional feature extraction*
  - Math/Stats Colloquium, San Jose State University, San Jose, CA, 2017.
  - 7th Annual Davis Math Conference, University of California, Davis, 2017.
  - Discrete Mathematics Seminar, Center for Mathematical Modeling, University of Chile, Santiago, Chile, 2016.
  - Graduate Group in Applied Mathematics Annual Meeting, University of California, Davis, 2016.
  - Department of Statistics, University of California, Davis, 2016.
  - Simons Seminar, University of Texas, Austin, TX. 2016

- *Heavy-tailed Independent Component Analysis*
  - Information Theory and Applications Workshop, San Diego, CA. 2016

- *Avoiding the curse of dimensionality: Computational efficiency in high dimensional inference*
  - Colloquium, Department of Mathematics, University of California, Davis, 2016.

- *Provably efficient high-dimensional inference*

  - Kent State University, Mathematics Department Colloquium, Kent, OH, 2015.

- *The centroid body:algorithms and statistical estimation for heavy-tailed distributions*

  - AMS Spring Southeastern Sectional Meeting. Special Session on Probabilistic and Analytic Tools in Convexity. University of Georgia, Athens GA, 2016.
  - Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, Workshop on Convex Geometry and its Applications, 2015.

- *Learning a hidden basis through imperfect measurements: an algorithmic primitive*

  - Information Theory and Applications Workshop, San Diego, CA, 2015.

- *The hidden convexity of spectral clustering*

  - Workshop on Spectral Algorithms: From Theory to Practice. Simons Institute, Berkeley, 2014.

- *On blocking and anti-blocking polyhedra in infinite dimensions*

  - Mixed Integer Programming Workshop, Columbus, OH, 2014.

- *The More, the Merrier: the blessing of dimensionality for learning large Gaussian mixtures*

  - Topology, Geometry and Data Analysis Seminar, The Ohio State University, Columbus, OH, 2014
  - Colloquium, Department of Mathematics, Applied Mathematics and Statistics, Case Western Reserve University, Cleveland, OH, 2014.
  - Banff International Research Station, Workshop on geometric tomography and harmonic analysis, Banff, Canada, 2014.
  - Information Theory and Applications Workshop, San Diego, CA, 2014.

- *A simplicial polytope that maximizes the isotropic constant must be a simplex*

  - AMS Fall Central Sectional Meeting. Special Session on Convex Geometry and its Applications. Washington University, St. Louis, MO, 2013.

- *Sections of convex bodies, statistical estimation and (in)stability*

  - American Institute of Mathematics, Workshop on sections of convex bodies, Palo Alto, CA, 2013

- *Simplicial polytopes that maximize the isotropic constant are highly symmetric*

  - Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, Workshop on Convex Geometry and its Applications, 2012.
  - University of Michigan, Department of Mathematics, Learning seminar, Ann Arbor, MI, 2012.
  - AMS Fall Central Sectional Meeting. Special Session on Harmonic Analysis and Convexity. University of Akron, Akron, OH, 2012.

- *Estimating the geometry of distributions: Learning convex bodies*

  - IST Austria, Klosterneuburg, Austria, 2012
  - Kent State University, Mathematics Department Colloquium, Kent, OH, 2012.

- University of Michigan, Department of Mathematics, Probability seminar, Ann Arbor, MI, 2012.

■ *Recent developments in column subset selection and volume sampling*

- Workshop on Probabilistic Techniques and Algorithms, University of Texas. Austin, Texas, United States, 2012.

■ *Randomized algorithms for the approximation of matrices.*

- Departmental colloquium, Department of Computer Science, The University of Iowa, 2011.
- University of Cambridge, Isaac Newton Institute for Mathematical Sciences, Programme on Discrete Analysis, Cambridge, UK, 2011.
- Foundations of Computational Mathematics. Budapest, Hungary, 2011.
- IMA Workshop on high dimensional phenomena, University of Minnesota. Minneapolis, Minnesota, United States, 2011.

■ *Efficient volume sampling for row/column subset selection.*

- Georgia Institute of Technology, College of Computing, ARC Colloquium, Atlanta, GA, 2010.
- IBM T. J. Watson Research Center, IP for lunch seminar, Yorktown Heights, NY, 2010.

■ *On the monotonicity of the expected volume of a random simplex.*

- Case Western Reserve University, Department of Mathematics, Colloquium, Cleveland, OH, 2010.
- Spring AMS Sectional. Random Matrix Theory and Applications session. Albuquerque, NM, 2010.
- The Ohio State University, Department of Mathematics, Applied Mathematics Seminar, Columbus, OH, 2010.
- Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, Workshop on Convex Geometry and its Applications, 2009.

■ *Expanders via random spanning trees.*

- University of Chile, Department of Industrial Engineering, Santiago, Chile, 2009.
- The Ohio State University, Computer Science and Engineering, Colloquium, 2009.
- Georgia Institute of Technology, Mathematics Department, Combinatorics Seminar, Atlanta, GA, 2008.
- Kent State University, Mathematics Department Colloquium, Kent, OH, 2008.
- Geometry in the Design of Algorithms Workshop, Princeton University, Princeton, NJ, 2008.
- University of California, Davis, Mathematics Department, Discrete Mathematics and Representation Theory Seminar, Davis, CA, 2008.

■ *The complexity of the volume.*

- Kent State University, Mathematics Department, Kent, OH, 2008.
- University of Chile, Department of Mathematical Engineering, Alumni Colloquium, Santiago, Chile, 2008.
- Geometry and Algorithms Workshop, Heriot-Watt University, Edinburgh, 2007.
- Georgia Tech-DIMACS Workshop on Phase Transitions in Random Structures and Algorithms. Atlanta, GA, 2007.
- Georgia Institute of Technology, Mathematics Department, Combinatorics Seminar. 2006
- Yale University. Discrete Mathematics and Theoretical Computer Science Seminar. New Haven, CT, 2006.

- *Matrix approximation and projective clustering via volume sampling.*

  - Workshop on Algorithms for Modern Massive Data Sets, Stanford University, Stanford, CA, 2006. (poster)
  - Toyota Technological Institute at Chicago, Chicago, IL, 2005.
  - IBM T. J. Watson Research Center, Yorktown Heights, NY, 2005.

SERVICE

- Organizer of a Special Session on "High dimensional convexity and applications" for the AMS Sectional Meeting at San Francisco State U., San Francisco, CA (with Stanisław Szarek and Elisabeth Werner) (2014).

- Member of the senior program committee of COLT 2021.

- Member of the program committee of COLT 2019, COLT 2018, AAAI 2016, LATIN 2012.

- IEEE Transactions On Pattern Analysis And Machine Intelligence (2019), Electronic Journal of Statistics (2018), ACM Transactions on Algorithms (2018), Discrete and Computational Geometry (2017), SIAM Journal of Discrete Mathematics (SIDMA) (2016), Mathematika (2016), STOC (2016, 2017), AISTAT (2015), Reviewer for National Science Foundation (2015, 2017), SIAM Journal on Computing (2015), International Symposium on Experimental Algorithms (SEA) (2014), ACM Transactions on Computation Theory (2014), NIPS (2014), Algorithmica (2014), Journal of the ACM (2014), COLT (2013, 2015, 2016), Electronic Communications in Probability (2012), IEEE Transactions on Information Theory (2012), National Research Funding Competition, FONDECYT, Chile (2011), Initiation into Research Funding Competition, FONDECYT, Chile (2011), ICALP (2011), LATIN (2010), European Journal of Operational Research (EJOR) (2010), SODA (2009, 2012, 2013, 2014), APPROX (2008), CSO (2008), RANDOM (2008), ESA (2007, 2010), SoCG (2007, 2009, 2019), FOCS (2006, 2008, 2011, 2015).